



PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BOARD OF PATENT APPEALS AND INTERFERENCES

#14
5-11-99

In re Application of

John Fyson

For

**METHOD OF TREATING WASTE
EFFLUENT**

Serial No. 08/795,961

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Examiner: N. McCarthy

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Washington, D.C. 20231
Attn: Box AF

Sir:

APPEAL BRIEF UNDER 37 C.F.R. 1.192

This is an appeal to the Board of Patent Appeals and Interferences
from a Final Rejection in the captioned application dated August 21, 1998. A
Request for Reconsideration Under 37 C.F.R. 1.116 was filed on November 23, 1998
and a Notice of Appeal was filed on February 4, 1999.

Filed herewith are the fee for filing a Brief, a Request for a one-month
extension of time and the corresponding extension fee.

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I Real Party in Interest

Eastman Kodak Company, a corporation of the state of New Jersey, having a principal place of business at 343 State Street, Rochester, New York 14650, is the assignee of the inventors in the application under appeal and is consequently the "Real Party in Interest" in this appeal.

II Related Appeals and Interferences

There are no related appeals or interferences.

III Status of Claims

Claims 1-20 were originally filed in the case. The amendment of 25 February 1988 amended claim 1 and cancelled claim 2. The amendment of 23 November 1998 further amended claim 1, cancelled claim 5 and amended claims 6 and 9.

Appendix I provides a clean, double-spaced copy of claims 1,3,4 and 6-20 which are on appeal. A few typographical errors occur in Claims 3, 11, 16, 19 and 20, which can be corrected upon allowance of the present application.

IV Status of Amendments

All of the noted amendments have been entered.

V Summary of Invention

The invention relates to a method of treating waste photographic effluent which contains reduced species, such as typically thiosulphate or sulphite, by oxidation with hydrogen peroxide, or a compound capable of releasing hydrogen peroxide, such as a perborate or persulphate, in the presence of a supported catalyst, the method taking place at room temperature and pressure.

The catalyst is selected from the group consisting of molybdate, tungstate, chromate and vanadate, preferably molybdate, and is immobilized on a substrate which permits permeation of the effluent into its interstices, presenting a large surface area of catalyst to the effluent. The substrate may typically be an ion exchange resin, especially an anionic exchange resin or a mixed bed resin comprising a mixture of anionic and cationic exchange resins.

Since the transition metal ions are adsorbed onto a substrate and the resin can be reused, there is very little transition metal discharge into the effluent, with corresponding environmental and economic advantages.

VI Issues

The issue presented for review by the Board of Appeals and Interferences is whether Claims 1,3,4 and 6-20 are obvious over Reißner, DE 3635219 A1, in view of Yan, U.S. Patent No. 5,552,063.

VII Grouping of Claims

Claims 1,3,4,6-9 and 11-20 are deemed a single group and will stand or fall together. Claim 10 which relates to a process with a redox-amplifier developer should be considered separately.

VIII Argument

Claims 1,3,4 and 6-20 have been finally rejected under 35 U.S.C. § 103 as being unpatentable over Reißner, DE 3635219 A1, in view of Yan, U.S. Patent No. 5,552,063. In paragraph 4 of the Final rejection dated 21 August 1998 the Examiner summarizes the basis for her rejection. Thus while Yan does not disclose the treatment of photographic effluent, requires elevated temperatures, uses air as the oxygen source and teaches the preferred use on a support of a combination of (transition) metals and not their oxidized or sulfided forms, the treatment of photographic effluent (with a solution of molybdate) is provided by Reißner. The Final Rejection considers that it would have been obvious to have used the supported catalysts taught by Yan in the process of Reißner.

The Final Rejection states that Yan discloses oxidation of offensive substances from waste water, including 'reduced species', such as thiosulphate and sulphite. Although there is no disclosure therein of the use of a supported substrate for photographic effluent, it is considered that the skilled artisan would have found the chemistry similar enough to conclude that it would be so applicable. Moreover the teaching of the treatment of dilute aqueous solutions of thiosulphate from

photographic effluent with hydrogen peroxide catalysed with a solution of molybdate is given in Reißner.

Yan discloses that a supported catalyst avoids the 'potential for the introduction of undesirable substances into the treated wastewater', suggesting that direct addition of catalyst in soluble form is undesirable. It is argued that the skilled artisan would appreciate that the use of a supported catalyst would mean it would be less likely to be solubilized by the waste water. The Examiner concedes that the transition metals are preferably used in combination, such as CoMo, i.e. the reduced forms of the metals although he mentions that a (para)molybdate and tungstate forms of the transition metals may be used to impregnate into the catalyst support, before activation of the catalyst by reduction or sulfiding. Further the Examiner states that the instant claims do not exclude the reaction conditions disclosed in Yan. The skilled artisan would be guided by Reißner for the selection of appropriate reaction conditions (i.e. temperature, pressure) and choice of oxidant, e.g. hydrogen peroxide.

Applicant respectfully disagrees that the invention is unpatentable over Reißner in view of Yan for the reasons below.

The appropriate analysis for an obviousness rejection under 35 U.S.C. § 103 is set forth by the U.S. Supreme Court in its opinion in Graham v. John Deere Co. 148 USPQ 459, 467, Supreme Court of the United States (1966), and as relied upon by the Examiner for this case, where it is stated;

Under Section 103, the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background, the obviousness or nonobviousness of the subject matter is determined.

Determining the scope and contents of the prior art

Reißner (DE'219) is already disclosed in Appellant's specification as describing the treatment of dilute photographic, aqueous solutions of thiosulphate by oxidation with hydrogen peroxide in the presence of a compound of chromium, vanadium, tungsten and in particular molybdenum, preferably as ammonium molybdate. The transition metal compound is added, at room temperature, directly to the effluent as a catalyst which is subsequently discharged into the environment.

Yan (US '063) describes contacting non-photographic wastewater containing offensive substances, such as phenol, ammonia, and optionally cyanide and/or sulphur-containing compounds, with a source of oxygen over a catalyst comprising a combination of a Group VIII and a Group VIA metal, such as NiMo, or a metal compound thereof, on a support, such as an ion-exchange resin or preferably activated carbon, at a temperature of from about 50°C to about 200°C and at a preferred pressure of from 10 to 500 psig.

Differences between the prior art and the claims at issue

The present invention concerns the use of a catalyst, specifically selected from molybdate, tungstate, chromate or a vanadate, which is immobilised on a substrate, such as an ion exchange resin, in the process of treating reduced species, such as thiosulfate and sulfite, in photographic waste effluent with hydrogen peroxide, or a compound capable of releasing hydrogen peroxide, the process taking place under normal conditions of temperature and pressure.

Reißner does not support the catalyst on a support

The catalyst is added as a solution to the thiosulphate solution and the hydrogen peroxide solution and the solutions are then stirred. Whilst the chemical oxygen demand (COD) of the effluent is thereby reduced, the transition metal ion contaminants are added to the effluent and subsequently discharged into the environment, such that

- (a) the environment is compromised and
- (b) the transition metal ions are not reusable

In Appellant's case the transition metal ions are adsorbed onto a substrate, such as an ion exchange resin, with the result that there is

- (a) very little transition metal discharge, with an environmental advantage, and
- (b) reuse of the resin, with an economic advantages.

From pages 7 and 8 of the specification it will be seen that an experiment conducted using 2 ml of 1% ammonium molybdate, firstly adsorbed onto resin and then repeated added directly to the effluent, resulted in final levels of Mo on the effluent in ppm of 0.55 to 86 respectively, clearly a substantial advantage of the invention.

The Examiner has attempted to overcome the deficiency in Reißner by citing Yan, which show the use of an ion exchange resin to immobilise a combination of transition metal catalysts. There are however several points of difference:

- (a) Yan does not relate to photographic effluent.

The wastewater he is concerned with contains phenol, cresol, ammonia and optionally sulfite and thiosulphate. Photographic effluent does not contain at least the first two of these components and the concerns faced by Yan to remove these is clearly inapplicable.

- (b) Yan teaches the use of air as an oxygen source.

According to Yan the source of oxygen is preferably air (col.8 lines 9-13), that ozone or molecular oxygen could also be used but that hydrogen peroxide is not contemplated to be intentionally added as a source of oxygen for this process (col.8 lines 11-13 and also claim 7). This leads away from the present invention.

- (c) Yan discloses the use of a combination of Group VIII and VI metals or metal compounds.

The catalyst is selected from the group of NiMo, NiW and CoMo on activated carbon (claim 1) and not their oxidised forms (see col. 5 lines 64 and 65), or sulfided catalysts. Yan states that the catalyst can be activated by reduction which again leads away from the catalysts preferred in the present invention. Catalysts containing

copper, cobalt, molybdenum and tungsten alone on activated carbon are said to be ineffective (col.11 lines 25-26).

(d) Yan requires an elevated temperature

The lowest temperature considered possible for the Yan process is 50°C (col.7 line 56) although the preferred range is 80°C-145°C.

(e) Yan requires the use of pressure

A pressure of 0-2000 psig is disclosed in Yan (col.7 line 55) but the preferred range and that present in claim 1 is 10 to 500 psig, i.e. for effective working of the invention both a raised temperature and pressure is required.

In the Appellant's specification the invention is limited to the use of hydrogen peroxide (or a compound capable of producing hydrogen peroxide) and not air for treating photographic effluent (which does not contain cresol or phenol). Only the oxidised form of a single transition metal is within the scope of Appellant's invention, namely the catalyst is selected from a molybdate, a tungstate, a chromate and a vanadate. The Appellant's invention may be carried out at room temperature and under atmospheric pressure.

It is submitted that the Yan reference specifically teaches away from the present invention in being limited to a combination of a Group VIII and a Group VIA metal or compound with a direct instruction that copper, cobalt, molybdenum and tungsten alone are ineffective for the purpose of that invention. The Examiner has relied on the passage on col.5 lines 25-31 of Yan as apparently teaching that the molybdate and tungstate forms of the metal may be impregnated into the support. However it is pointed out with respect that this paragraph refers back to the previous one which states that impregnation of the combination of metals or metal compounds can be either sequential or carried out in one step.

Indeed the examples further confirm that a combination is required. Comparative examples 1-9 having a single metal on a support show negligible removal of phenol and cresol even at high temperatures (120°C) and pressures (35 psig). In contrast catalysts using CoMo and NiW in particular showed a very large removal of phenol and cresol, up to 99% of each in some cases. The skilled artisan would not be led by the teaching in this document that unwanted species from

photographic effluent, which do not contain cresol or phenol, could be treated by hydrogen peroxide, which is specifically contraindicated in Yan, by the use of the oxidised form of a single transition metal immobilized on a substrate, which is taught in Yan to be ineffective. Although the claims of Appellant's application are not so limited, nor would it have been predicted that Appellant's invention could be achieved so simply under conditions of ambient temperature and pressure.

The Examiner has quoted col. 2 lines 0-30 of Yan as specifically disclosing that supported transition metal catalysts result in little of the metal catalyst being leached from the surface of the support and remaining in the treated effluent. The Appellant does not however read this as the teaching of this section which merely states that the object of the process is to leave a low concentration of metal compound in the treated wastewater. The potential for the introduction of undesirable substances refers specifically to 'intentionally added SO₂ type compounds and the soluble (transition) metal catalysts' (col.2 lines 2 and 3) and not to those in a supported or complexed form (col.1 line 54).

It is submitted that the references cited by the Examiner alone or in combination do not teach or render obvious the present invention. In particular a significant patentable advance has been made over the Reißner reference and the Yan reference teaches away specifically from the present invention so that there was no incentive for the skilled addressee to consider these references in combination to achieve the environmental and economic advantages thereof.

IX Arguments as to Separate Patentability of

Dependent Claims

Claim 10 relates to an effluent from a process with a redox-amplifier developer. As stated on page 2 lines 26-32 of Appellant's specification, a redox-amplification (RX) process is performed upon a photographic element containing a reduced silver laydown compared with conventional silver halide photographic materials. The low dye formation from the reduced amount of silver is acceptable because the resulting silver image is then used to produce more oxidized developer by the action of oxidizing agent, specifically hydrogen peroxide, on the catalytic surface

provided by the silver image. The oxidized developer can then be used to form more image dye which 'amplifies' the image.

Since hydrogen peroxide is employed in the development step of an RX process it may be unnecessary for the method of this invention to add additional peroxide to the photographic effluent, providing a further advantage of Appellant's invention.

Reißner does not hint, teach or suggest that the effluent resulted from the development step of a RX process, with this attendant advantage.

Yan does not relate to photographic effluent, let alone to effluent from a RX process with its special characteristics.

Appellant therefore submits that claim 10 clearly has the required patentability over Reißner and Yan, both singly and in combination.

X Summary of Arguments

In summary, the Applicant submits that the references cited in the Final Rejection do not teach or suggest the present invention, namely the process of treating photographic effluent nor the apparatus for treating the effluent obtained from the process, to one skilled in the art. Thus the Examiner has failed to meet the burden required to support a rejection under 35 U.S.C. § 103. It is requested that the Final Rejection be reversed and that this application be remanded to the Examiner with instructions to pass the application to issue.

Respectfully submitted



J.Lanny Tucker

Attorney for Appellant
Registration No.27,678

JLT/sp
Telephone: (716) 722-9332
Facsimile: (716) 477-1148

APPENDIX A

Claims on Appeal

1. A method of treating waste effluent containing reduced species by oxidation with hydrogen peroxide, or a compound capable of releasing hydrogen peroxide, in the presence of a catalyst therefor, selected from the group consisting of molybdate, tungstate, chromate and vanadate, wherein said catalyst is immobilised on a substrate therefor.

3. A method as claimed in either of the preceding claims characterised in that the reduced species are sulphur-oxygen species.

4. A method as claimed in claim 3 characterised in that the sulphur-oxygen species are thiosulphate or sulphite.

6. A method as claimed in claim 1 wherein the catalyst is a molybdate.

7. A method as claimed in claim 1 characterised in that the substrate constitutes a porous mass which permits permeation of the waste effluent into its interstices, thereby presenting a large surface area of catalyst to the effluent.

8. A method as in claim 1 characterised in that the substrate is an ion exchange material.

9. A method as in claim 8 wherein the substrate comprises an anion exchange material.

10. A method as in claim 1 characterised in that the effluent is from a process with a redox-amplifier developer.

11. A method as in claim 1 characterised in that the effluent is from a process wherein the fixer contains an amount of sulphur-oxygen species greater than about 20g of thiosulphate (based on ammonium thiosulphate).

12. A method as in claim 1 characterised in that hydrogen peroxide, or a compound capable of releasing hydrogen peroxide, is combined with a soluble alkali whose conjugate acid has a pKa of < 8.5 , prior to reaction with the effluent, to reduce the final pH of the effluent to about 5 to 9.

13. A method as in claim 12 characterised in that the alkali is a soluble bicarbonate, alkanoate or dihydrogen phosphate.

14. A method as in claim 13 characterised in that the alkali is potassium bicarbonate.

15. Holding tank apparatus (10) for treating waste effluents, which holding tank apparatus (10) comprises a receptacle (17) containing a catalyst, which catalyst is adapted for catalysing the oxidation of reduced species in waste effluents by hydrogen

peroxide, or a compound capable of releasing hydrogen peroxide, and which catalyst is immobilised on a substrate (16) therefor in the receptacle (17), an inlet (11) for introducing effluent from a development process to the receptacle (17), and an outlet (12) fitted with selectively operable closing means (13).

16. Holding tank apparatus (10) as claimed in claim 15 characterised in that the waste effluent is as claimed in any one of claims 2-4, 11 and 12.

17. Conduit apparatus (20) for treating waste effluents, which conduit apparatus (20) comprises a conduit (27) containing a catalyst, which catalyst is adapted for catalysing the oxidation of reduced species in waste effluents by hydrogen peroxide, or a compound capable of releasing hydrogen peroxide, and which catalyst is immobilised on a substrate (26) therefor, an inlet (21) for introducing waste effluents to the conduit (27), and an outlet (22); whereby in use, waste effluents are supplied continuously to the conduit (27) at a volume throughput to achieve substantially complete oxidation of the reduced species.

18. Conduit apparatus (20) as claimed in claim 17, characterised in that the substrate (26) is porous and is packed in the conduit (27).

19. Conduit apparatus (20) as claimed in either claim 17 or 18 characterised in that the waste effluent is as claimed in any one of claims 2- 4, 10 and 11.

20. Apparatus for treating water effluents (40) in a continuous manner as claimed in any one of claims 18 to 20 characterised by including a pump (130) for pumping waste effluent from a holding tank (180), a pump (70) for pumping hydrogen peroxide, or a compound capable of releasing hydrogen peroxide, or its combination with a soluble alkali whose conjugate acid has a pK_a of < 8.5 , for mixing with the waste effluent prior to passing over the catalyst immobilised on the substrate (140).

APPENDIX B

REFERENCES CITED

Reißner, DE 3635219 A1,

Yan, U.S. Patent No. 5,552,063.